SCIENCE AS A WAY OF KNOWING
REPORT TO THE COSPONSORING ORGANIZATIONS
31 January 1985

The Science as a Way of Knowing project now has two years of experience, financial backing for its first four years, and individuals committed to operate its programs through 1986. The time seems appropriate, therefore, that a general report on operations be made to the cosponsoring organizations. It is important that this be done because many of the societies change their officers each year and those taking office in 1985 will probably not be familiar with this project that their society is cosponsoring.

Consponsors. The project, which is being developed by the Education Committee of the American Society of Zoologists, is cosponsored by:

The American Association for the Advancement of Science
The American Institute of Biological Sciences
The American Society of Naturalists
The Association for Biology Laboratory Education
The Biological Sciences Curriculum Study
The Genetic Society of America
The National Association of Biology Teachers
The Society for College Science Teachers
The Society for the Study of Evolution
The University of California, Riverside

Goals. The project hopes to increase the effectiveness of biological education in the colleges and universities. Our primary audience consists of those who teach the college and university courses in biology, especially the introductory courses. This educational level was selected because it is critical in educational reform. Currently essentially all of the national effort seeks to reform education at lower levels and higher education is rarely mentioned as a problem. But if the

leaders of society and the teachers in the schools are judged to be deficient in ability to reach decisions involving science or to teach science, who is to blame? One cannot escape the obvious: the universities are providing neither potential leaders nor teachers with an adequate understanding of science. This deficiency is affecting not only life in America but is also being reflected in our loss of international leadership in invention and production and in our tremendous trade deficits.

Improvement in biological education at the college and university level cannot immediately reverse these serious national and international problems but it can become part of a long overdue reform of higher education. We have two main goals: to decrease the load of factual material while paying special attention to the conceptual basis of biology, and to deal explicitly with human problems with an important biological component. A lengthy discussion of our goals will be found in pages 421-422 and 469-481 in the reprint Science as a Way of Knowing--Evolutionary Biology and pages 4-7 of the reprint Science as a Way of Knowing--Human Ecology. These reprints have either already been sent to you or are included with this report. These first two reprints will enable you to decide for yourself the degree to which we are achieving our goals.

Procedures. Each year we select an important subfield of biology for consideration. In 1983 it was Evolutionary Biology and in 1984 it was Human Ecology. Each year's subfield is developed as follows:

1. A symposium with 5-8 outstanding speakers is presented at the Annual Meeting of the American Society of Zoologists (27-30 December).

2. Those attending the symposium are given a preprint of an Essay that treats the topic of the year (an example is Science as a Way of Knowing--Human Ecology which, if not included with this report, was sent to you earlier).

3. A Film Program showing films appropriate for the year's topic is presented at the Annual Meeting.

4. The May issue of the American Zoologist appearing after the Annual Meeting contains the full proceedings: the papers given in the Symposium, the Essay, and a description of the Film Program (an example is Science as a Way of Knowing--Evolutionary Biology reprinted from the May 1984 issue of the American Zoologist, which is either included here or was sent to you earlier).

The Symposia were planned and the Essays written for the first two symposia by John A. Moore, who is scheduled to do the same for Genetics in 1985 and Developmental Biology in 1986.

The 1983 Annual Meeting: Evolutionary Biology. This was held in Philadelphia 27-30 December. The speakers in the Symposium were:

John A. Moore	Opening remarks
William V. Mayer	The arrogance of ignorance--Ignoring the ubiquitous
E. Peter Volpe	The shame of science education
Marvalee H. Wake	Evolution:The biology of whole organisms
Stephen J. Gould	Paleontology and geology
Bruce R. Levin	Molecular evolution

The Film Program was orgainzed by Nathan H. Hart

The 1984 Annual Meeting:Human Ecology. This was held in Denver 27-30 December. The speakers in the Symposium were:

John A. Moore	Opening remarks
Paul R. Ehrlich	Human ecology for introductory biology courses--An overview
Anne H. Ehrlich	The human population:Size and dynamics
John L. Fischer	Man and food
James N. Pitts, Jr.	On the trail of atmospheric mutagens and carcinogens--A combined chemical/microbiological approach
Lester Breslow	Trends in health--Ecological consequences for the human population

Robert M. May	Ecological aspects of disease and human populations
G. Carleton Ray	Man and the sea--The ecological challenge
Garrett Hardin	Human ecology--The subversive, conservative science

The Film Program was organized by Nathan H. Hart and Gary Anderson.

Distribution of the reprints. One thousand preprints of the 1983 Essay, Science as a Way of Knowing--Evolutionary Biology, were printed. About 800 were distributed at the Symposium and the remainder to individuals and organizations requesting copies. The Essay and the papers of the symposium speakers were published in the May 1984 American Zoologist, which is distributed to 6400 individuals and libraries. In addition about 9200 reprints were printed. As of October 1984, 6573 had been distributed. Each of the 4,202 members of the Society for the Study of Evolution and the 700 members of the Society for College Science Teachers were sent a copy. In addition various organizations requested and were provided with copies: Biological Sciences Curriculum Study (500), National Association of Biology Teachers (200), and the Association for Biology Laboratory Education (200).

Requests continue to arrive from individuals all over the world. By now there must have been nearly a thousand. Most individuals request the papers of several or even all of the authors. These requests are assembled and each individual is sent a copy of the entire proceedings--all the papers and the Essay.

Our plans for the distribution of the proceedings of the just concluded Science as a Way of Knowing--Human Ecology Symposium are different. Twelve hundred preprints of the essay were obtained. About 1050 were either distributed at the Symposium or mailed to individuals. We are not planning to distribute reprints of the entire proceedings to large groups--such as all the members of a society. Organizations will be given small quantities if they wish but, for the most part, copies will

be sent only to individuals making a request. We hope this will prove to be more efficient and economical--especially since the Human Ecology reprint will total about 300 pages (Evolutionary Biology was only 115 pages in length).

Budget. The Science as a Way of Knowing project depends absolutely on funds provided by the Carnegie Corporation of New York. The first grant of $18,470 supported the symposium on Evolutionary Biology in 1983. A second grant of $121,600 supported the symposiun on Human Ecology in 1984 and will support Genetics in 1985 and Developmental Biology in 1986. These monies enable us to pay the travel expenses of those participating in the symposia and for the printing and distribution of the proceedings. Apart from a tiny "overhead" to the ASZ office, no Carnegie funds are expended for honoraria, consulting fees, or secretarial help. The speakers and organizers of the symposia have given freely of their time. The organization of the symposia and the writing of the essay is done at the University of California Riverside, which provides space and so far has been able to partially cover expenses for telephone calls, xeroxing, and postage. A major expense is the cost of mailing the reprints. Our procedure is as follows. Mailing labels are prepared and sent to the ASZ office, which then mails the reprints. The ASZ office is able to take advantage of a special bulk mailing rate. This cuts the postage charges to about one-quarter of what they would be otherwise.

Role of the Cosponsoring Societies and Organizations. Apart from the very significant support of the University of California, Riverside no other cosponsor has been called upon for any significant level of monetary support. It should not be concluded from this that their roles are unimportant. By cosponsoring each contributes mightily to what Science as a Way of Knowing is trying to do--improve education at the college and university level. The list of cosponsors is most impressive--it carries a clear and positive message to professional biologists

that the improvement of education in biology is a matter for concern and action by all of us.

Now that the Science as a Way of Knowing project gives evidence of beginning to achieve its goals and of having a good probability of survival, additional ways of involving the cosponsoring societies and organizations should be explored. There are many ways that this could be done.

1. The cosponsoring societies should tell their members about the Science as a Way of Knowing project.

2. At annual or other meetings of the cosponsoring societies where there is a table or booth describing the activities of the society, information and copies of reprints relating to the Science as a Way of Knowing project could be included. After all, the project is part of the cosponsoring societies' activities.

3. Advice and evaluations about the project's plans and procedures are needed.

4. Cosponsoring societies should consider holding their own symposia based on the Science as a Way of Knowing approach or develop related activities. Materials developed for Science as a Way of Knowing could be made available and the Science as a Way of Knowing symposia themselves could be repeated.

5. The project's materials could be made available for the societies membership if such was deemed useful--as was done with the Evolutionary Biology proceedings for the Society for the Study of Evolution and the Society for College Science Teachers.

6. Those responsible for initiating Science as a Way of Knowing assume that it will require about 8-10 years to cover the main topics in biology. Thereafter, if the project continues to serve a useful purpose, a cycle of revision could ensue--it is hard to imagine a time when a constant concern with improving education will not be necessary and important. Thus, all of us should think about the future.

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